LAHAINA PUMP DITCH NUMBER 1
Pioneer Mill Company
Lahaina
Maui County
Hawaii

HAER No. HI-88

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

Historic American Engineering Record
National Park Service
Department of the Interior
Washington, D.C.

HISTORIC AMERICAN ENGINEERING RECORD

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PIONEER MILL COMPANY

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Location:	Lahaina County of Maui Hawaii USGS 7.5 minute series topographic map, Lahaina, HI 1999 Universal Transverse Mercator (UTM) coordinates: 04.2052979.15639862 04.2051067.15639181
Date of Construction:	Nineteenth century, after 1883
Engineers & Builders:	Unknown
Present Owners:	Pioneer Mill Company and Kamehameha Schools, Bernice Pauahi Bishop Estate
Present Occupant:	Vacant
Present Use:	Abandoned
Significance:	The Lahaina Pump Ditch Number 1 is significant for its associations with the development of the sugar industry on the west side of Maui during the late nineteenth and twentieth centuries. It is a good example of an irrigation ditch constructed to bring water to the cane fields located in the arid coastal plain of Maui's leeward side. It reflects its period in its materials, method of construction, and design.
Report Prepared by:	Don J. Hibbard, Ph.D. Architectural Historian Mason Architects, Inc. 119 Merchant Street, Suite 501 Honolulu, HI 96813
Date:	August 2009

GENERAL DESCRIPTION AND LOCATION

The Lahaina Pump Ditch Number 1 stands abandoned in the midst of the Pioneer Mill Company's former cane fields. It runs parallel to the shoreline at approximately the ninety-five foot contour line. Originally constructed as an unlined ditch in the late nineteenth century, it was lined with four inches of concrete in 1920-1921, at a time when Pioneer Mill Company was faced with a water shortage and was motivated to reduce water loss. The ditch is almost four miles long. At one point it irrigated approximately 860 acres of sugar cane growing in fields 11B, 12C, 13D, 14C, 15C, 16C, and 17C, which were renumbered at some point between 1918 and 1921 to be fields K-1, L.D. 5, 7, and 8, and M.D. 1, 2, 3, 4, 5, 6, 7, 8, and 9. The fields are on the down slope side of the ditch.

The ditch is lined with concrete with slightly battered concrete and rubble-concrete walls. The ditch is approximately 31" deep and 4' wide at the top. The walls are approximately 14" wide and near ground level on each side.

The ditch is abandoned and overgrown with vegetation along both the sides and in the silt-covered bed. Approximately 5,250 feet of the ditch runs through the proposed highway corridor (see project information statement). Typical segments of this portion, which included former gates, were photographically recorded.

Immediately below the ditch, near Waine'e, is a small lava rock lined reservoir,named Pump B Reservoir, which stored waters provided by Lahaina Pump B. Pump B drew its waters from a water tunnel. On the bank directly above Pump B Reservoir is another pump house with standing seam metal walls and roof. It houses a small pump in a reinforced concrete basement, and transported the water from the reservoir to the ditch. Neither the pump nor the now abandoned reservoir are within the project area and thus are not included in this study.

The ditch passes through Tax Map Key (TMK) parcels 4-6-14: 1 and 2; 4-6-15: 3; 4-6-18: 2 and 3; 4-6-19: 4; 4-7-1: 28, and 4-7-3:1.

HISTORICAL CONTEXT

The beginnings of Pioneer Mill Company date back to 1860, when James Campbell started a small sugar plantation in Lahaina. The enterprise included a modest mill powered by mules, which Campbell used to not only grind his cane, but also that of his neighbors. Soon after the establishment of the new plantation

Henry Turton and James Dunbar joined Campbell, naming the operation Campbell & Turton. In 1865, Dunbar left the company and the plantation became known as Pioneer Mill Company. By 1874, Campbell and Turton had expanded their holdings, having acquired the Lahaina Sugar Company and the West Maui Sugar Company, a venture started by Kamehameha V.

In 1877, Turton bought out Campbell for $500,000, but eight years later Turton declared bankruptcy and sold the property back to Campbell and Paul Isenberg. At the time of the sale Pioneer Mill Company was cultivating 600 of its 900 acres. Mr. C. F. Horner was selected to manage the plantation.

In 1889, Campbell sold his interest to Horner, and in 1895 Horner and Isenberg incorporated Pioneer Mill Company. Following the annexation of Hawaii by the United States in 1898, the corporation increased rapidly in size and value. In 1902 the plantation had 1,800 acres in cane, and by 1910 it had 8,000 acres under cultivation. In 1916 the firm was valued at $5,000,000. In 1918, Horner sold his interest to the plantation's agents, American Factors.

In 1931, the Olowalu Company was purchased by Pioneer Mill, adding another 1,200 acres of contiguous cane land to the plantation, and by 1935, over 10,000 acres, half-owned by Pioneer Mill Company and half leased from the Territory and Bernice Pauahi Bishop Estate, were in cane production.

Because of the dry, leeward climate of Lahaina, water was of primary concern for the owners and managers of Pioneer Mill Company, as the fields in the center of the plantation received only ten to twenty inches of rainfall a year. In 1922, in the midst of a drought, Pioneer Mill Company president Allen W. T. Bottomley, in the annual report to the stockholders, tersely and concisely summed up the plantation's situation:

> The crop varies in almost exact proportion as the water per acre increases or decreases; and likewise, that the water per acre increases or decreases according to rainfall. Considerable criticism has come from time to time because of the short crops and poor showing made by your Company, and the reason for these short crops is a lack of water. (page 4)

Irrigation of Pioneer Mill Company's fields, an area which eventually ran approximately fourteen miles long and one and one half miles wide with altitudes between 10 and 700 feet, was accomplished with water drawn from artesian wells and also from water transported from the West Maui Mountains via eight ditch systems. The McCandless brothers drilled the first well on Maui for Pioneer Mill Company in 1883, four years after James Ashley had drilled the first artesian well in Hawaii at Ewa for James Campbell. Throughout the nineteenth century

the plantation was dependent upon artesian wells at Lahaina, Ka'anapali and Wahikuli to provide water for most of their crop. During 1901 the company constructed eight reservoirs, three at Lahaina, four at Ka'anapali, and one at Wahikuli, to store the waters produced by the artesian wells. In addition to the reservoirs the plantation constructed five miles of flumes and twenty five miles of ditches to connect the reservoirs. The reservoirs allowed the company to abandon their expensive and inefficient practice of night irrigation, and also permitted the irrigation of an additional six hundred acres of newly acquired land.

Also at this time, the plantation manager, L. Barkhausen, began to explore the possibility of obtaining water from Alexander & Baldwin from Honokohau Gulch. He also began to develop more water tunnels in the West Maui mountains. By developing these new sources of water, he hoped to eliminate the number of water pumps operated by the plantation, which would result in a significant monetary savings, as the plantation had to purchase coal to operate the wells' steam powered pumps. Barkhausen also considered converting the company's steam pumps at Lahaina to electric, with the electricity provided by a hydro-electric plant constructed in the mountains. He estimated the cost of erecting a hydro-electric plant would approximately equal one year of coal consumption and operating expenses associated with maintaining the five Lahaina pumps during the dry season. However, he did not pursue this cost-saving avenue, as he believed the development of water sources in the mountains and at Honokohau would make the artesian wells superfluous.

In 1903 three more water tunnels were completed, and in May 1904 the much anticipated Honokohau Ditch opened, providing Pioneer Mill Company with an additional twelve million gallons of water a day (mgd), with the ditch extending the entire length of the plantation at the 700' elevation. The nine reservoirs below that elevation had a combined storage capacity of seventy million gallons. The new ditch saved considerable pumping expense and allowed an additional one thousand acres to be planted in cane. The Ka'anapali pumps were abandoned (in part because of rising salt content), the Wahikali pumps only operated during planting time, and management hoped the plantation could eventually shut down its pumping operations. However, such was not to be the case, and in 1905 the Board of Directors again looked into the feasibility of converting Lahaina's steam pumps to electric, as they believed Kaua'ula stream could provide sufficient water power to amortize within two years the expense of constructing a plant. Upon further study, this idea was dropped, and instead in 1907 the plantation converted its coal burning steam driven pumps to fuel oil, and entered into a seven-year contract for fuel oil. The cost savings were substantial, as the plantation had expended $75,345.89 on coal in 1905, and $76,230.24 in 1906, while their fuel oil bill for 1907 came to $38,728.24.

The plantation continued to concentrate on developing mountain ground water sources, and the addition of another one mgd in 1910 allowed the expansion of

the plantation's acreage at Launiupoko, where the reservoir's capacity was increased from two to ten million gallons. In addition, a new siphon, ditch and flume system at Kahoma allowed water from Ka'anapali and Wahikuli to be transported to Lahaina, reducing the stress on its wells. During 1910 the plantation's 3,745 acres of cane produced 27,298 tons of sugar.

Starting in 1911 the amount of water provided by the Honokohau ditch dropped from sixteen-and-one-half mgd to fifteen mgd, and in 1912 it slipped further to twelve mgd and in 1913 to ten mgd, the result of the unlined ditch being poorly maintained. As a result the pumps for the artesian wells had to operate steadily, and the company ordered machinery for a new five hundred kilowatt (kw) hydro-electric plant, which was erected at Kaua'ula in 1913 to power new centrifugal pumps at the Mill Pump Station and Lahaina pump station. To further alleviate water concerns, the water lease with Alexander & Baldwin, which was to expire in 1915, was renegotiated for an additional fifteen years, and work commenced to rebuild the the Honokohau ditch with concrete. The resulting concrete-lined ditch, named the Honolua ditch, opened on November 12, 1913, and during 1914 provided Pioneer Mill Company with thirty three mgd. However, this dropped to twenty seven mgd in 1915, and at the start of 1917, when a dry spell hit, its production dropped to nineteen mgd, and by the end of the year was only providing twelve mgd. As a result the company had to pump approximately four more mgd than in the previous year. Thanks to the increased pumping, the cane in the fields below the pump ditches was saved, but those above suffered. To compound the plantation's woes, the water flow in Kaua'ula Stream was too low to generate electricity, resulting in the purchase of an additional 35,000 barrels of fuel oil to operate the steam pumps.

The drought continued for several years, with the new Honolua Ditch providing only fifteen mgd in May, 1919, ten mgd in June, and a mere 5.7 mgd in December 1919. As a result the plantation, in an effort to conserve water, instituted a program to concrete line all its old ditches, doing those in the Lahaina and Ka'anapali areas during 1920 through 1922, with the lining of the lower pump ditch (Lahaina Pump Ditch Number 1) completed in 1921, allowing work to commence on the upper pump ditch. The plantation's relining efforts would continue through 1927.

During 1920, the plantation pumped more water than in any previous year. The wells at Wahikuli and the Mill had to be shut down as they hit salt water, but the Lahaina and recently reopened Ka'anapali wells remained pure. Lahaina at this time was operating one electric and two steam pumps. In 1918, steam pump A was not used, while Steam Pump B ran for 246 days, and Electric Pump 1 operated for 211 days. In 1919 Pump A was pressed into use for 66 days, B for 297 days and 1 for 308 days. The following year B ran for 303 days and 1 for 306 days. With dry years continuing into the 1920s, the plantation installed an oil burning 1500 kw steam turbine in 1923 at Ka'anapali, to reduce its dependence

on hydro-electricity. The plantation also moved to reduce its reliance on steam-powered pumps, replacing steam pumps A and B at Lahaina with electric pumps in July and September 1925, respectively. The annual report for 1925 indicated the shift from steam- to electric-powered pumps reduced operational costs by twenty percent. The plantation-wide conversion of steam- to electric-powered pumps became reality in 1927 when a 3,000 k.w. steam turbine was added to the power plant at Ka'anapali. The following year, 1928, signaled the first full year that the plantation used only electric pumps, placing the plantation "far less at the mercy of unfavorable weather conditions" (*Maui News*, August 18, 1926, page 1).

By 1935, Pioneer Mill had spent over $3,000,000 on water development, including gravity systems and pumped ground water supplies. Gilmore's *Hawaii Sugar Manual for 1936* reported that the plantation was obtaining approximately fifty six percent of its water from the mountains, and forty four percent from wells. The bulk of the mountain water derived from the Honolua Ditch, which was completed in 1913 and relined between 1923-1928.

The plantation's dependence on ground water pumped to the surface continued until Pioneer Mill Company shut its doors in 1999. Faced with international competition, Hawaii's sugar industry, including Pioneer Mill Company, found it increasingly difficult to economically survive. Seeing hard times ahead, Pioneer Mill Company took 2,000 acres out of cane during the 1960s to develop Kaanapali as a visitor resort destination. By 1986 the plantation, which at its height had 14,000 acres planted in cane, had reduced its acreage down to 4,000. Similar reductions in the size of the work force occurred, and the company that employed 1,600 workers in 1910, had a workforce of only 200 in 1986. Between 1993 and 1998, Pioneer Mill Company's sugar operations lost seven million dollars, and when it was projected that it would lose another two million dollars in 1999, the company decided to close its doors at the end of the harvest season. At the time of the company's closing Lahaina Pump Ditch No. 1 was abandoned.

SOURCES

Original Maps

Pioneer Mill Company, Cane Fields, Lahaina, Maui, Surveyed by Wright & Awana, February 1918

Pioneer Mill Company, Irrigation Map, 1922

Pioneer Mill Company, Lahaina, Maui, traced by M. C. Beleno, December 16,1937

Sugar Plantation at Lahaina, Maui, T. H. Owned by Pioneer Mill Company, Wright & Awana Base Map, traced by E. T. Gillin, 1921.

Sugar Plantation at Lahaina, Maui, T. H. Owned by Pioneer Mill Company, Wright & Awana Base Map, traced by E. T. Gillin, 1927

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"Factory and Plantation Data Section, Pioneer Mill Company," 1931, pages 196-200.

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"Pioneer Mill Ending Sugar Operations," March 3, 1999, A-1.

"Mill Closing Saddens Few," September 6, 1999, B-1.

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"Lahaina Sugar Cane Workers, Lands Face Unpredictable Future," September 3, 1999, A-3.

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"Pioneer's Hydro-Electric Plant," May 24, 1913, page 2, col. 1.

"New 800 K.W. Power Plant," December 22, 1916, page 1, col. 1.

"Pioneer Mill Improvements," August 18, 1926, page 1, col. 7.

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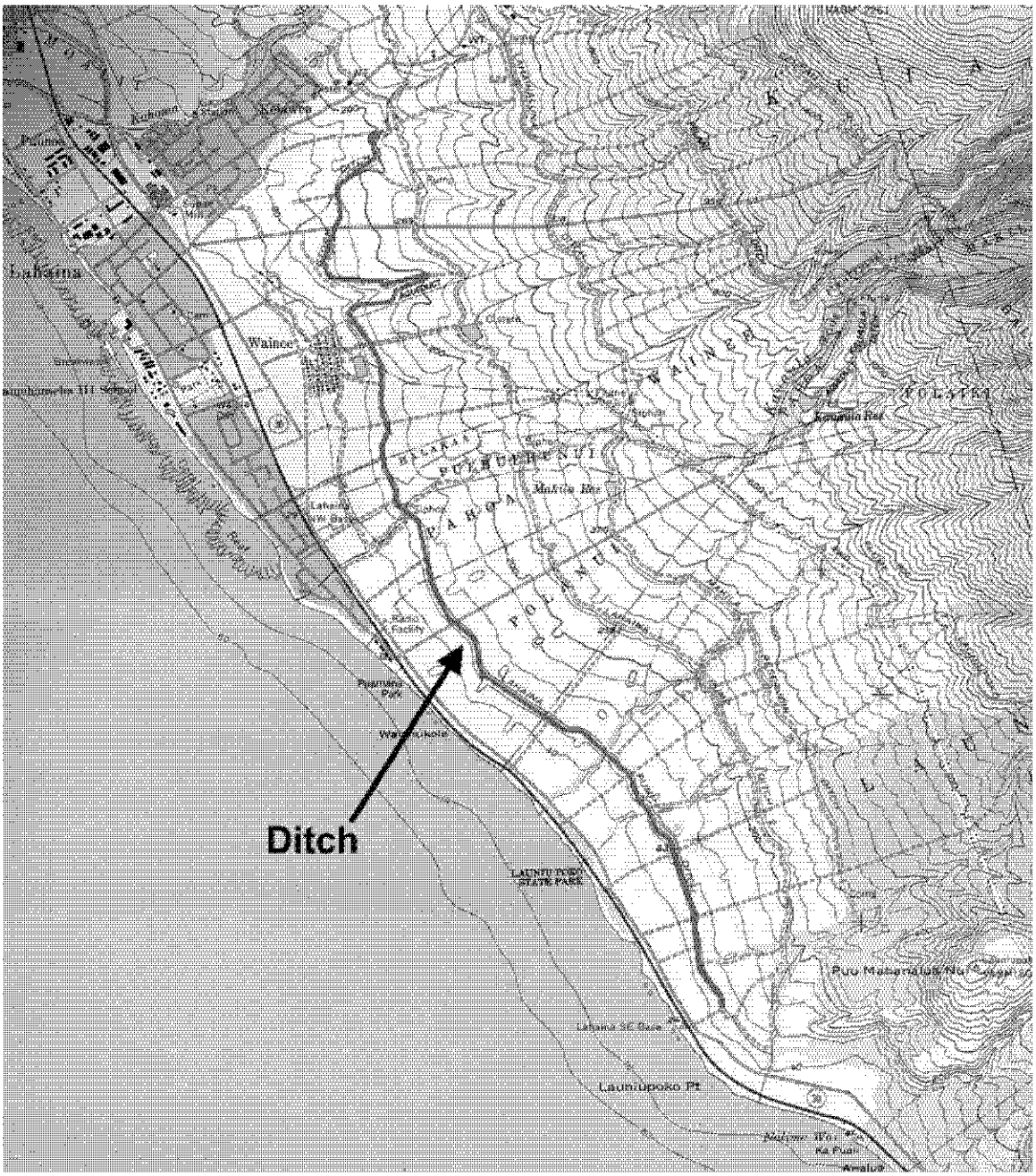
PROJECT INFORMATION

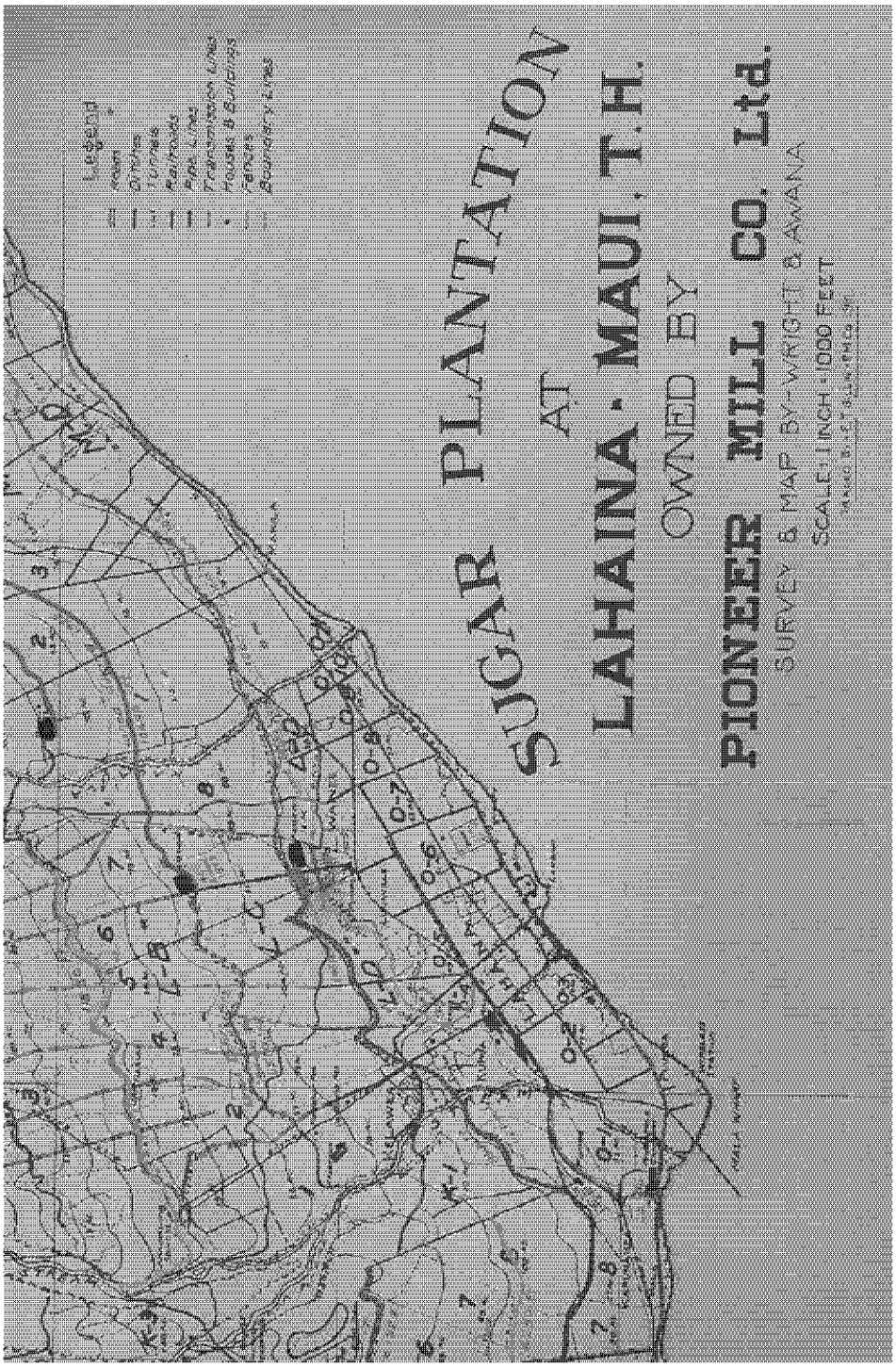
The following documentation was prepared in response to the proposal to demolish a portion of the Lahaina Pump Ditch Number 1, which is in the right-of-way of a proposed Honoapi'ilani Highway realignment (Lahaina By-Pass Highway). The purpose of this documentation is to historically and photographically record the ditch and its associated structures. The State of Hawaii Department of Transportation (DOT) and the Hawaii State Historic Preservation Division (SHPD) have agreed that the ditch is over fifty years old and appears to meet the criteria for listing in the Hawaii and National Registers of Historic Places. SHPD recommended that Historic American Engineering Record (HAER) documentation be completed as a means of mitigating the loss of this historic property. The DOT agreed to the SHPD's request for documentation following HAER standards.

The project manager for the HAER documentation was Polly Cosson Tice of Mason Architects, Inc. Don J. Hibbard, Ph.D. of Mason Architects was the researcher and author of the report. Both Polly Cosson Tice and Don Hibbard are architectural historians who meet the Secretary of the Interior's Professional Qualifications in architectural history. Carol Stimson of Mason Architects assisted with the editing and production of the reports. The large-format photographs were taken by David Franzen of Franzen Photography.

Location Map
U.S.G.S. Lahaina, Hawaii, 1983



"Sugar Plantation at Lahaina Maui", 1923 color overlay on 1921 map



Irrigation Map, Pioneer Mill Company, 1922